FAST ETHERNET SWITCH MODULE
(3H02-04 AND 3H08-04)
USER GUIDE

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The Complete Networking Solution™

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CHAPTER 1

INTRODUCTION

Welcome to Cabletron Systems **Fast Ethernet Switch Module** (**3H02-04 and 3H08-04) User Guide**. This manual provides information for configuring, monitoring, and maintaining the Fast Ethernet (FE) Switch Modules. The two types of FE Switch Modules are:

• **3H02-04**, 4 port 100TX Switch Module - UTP/RJ45

• **3H08-04**, 4 port 100FX Switch Module - Fiber/ST

• The name FE Switch Module(s) will be used to discuss both types of modules throughout this manual, unless there is a need to call attention to some characteristic of an individual module.
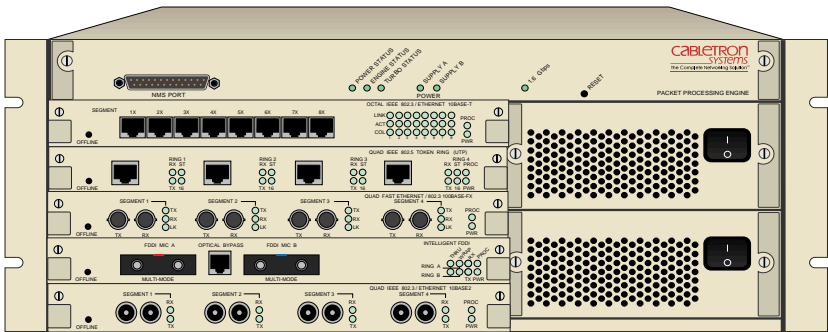
Figure 1-1   ATX Front Panel

1.1 USING THIS MANUAL

Read this manual to gain an understanding of the features and capabilities of the FE Switch Modules. A general knowledge of Ethernet and IEEE 802.3 type data communications networks and their physical layer components will be helpful when installing and using these devices.

Chapter 1, **Introduction**, outlines the contents of this manual, briefly describes the features of the modules, related documents, and how to get help.

Chapter 2, **Connecting to the Network**, describes how to physically attach the module to an Ethernet network.

Chapter 3, **Configuring**, discusses the software configuration options for the modules.

Chapter 3, **Monitoring**, provides information on Ethernet port statistics obtained through Local Console Manager.

Chapter 4, **Diagnostics and Troubleshooting**, discusses identifying possible problems with the module.

Chapter 5, **Adding/Swapping Modules**, gives instructions for adding and replacing a module.

Appendix A, **Specifications**, lists the pertinent technical information about the modules.

Appendix B, **Cables**, lists the pertinent cabling information about the modules.

1.2   OVERVIEW

Cabletron Systems Fast Ethernet Switch Modules connect the ATX hub to a maximum of four individual Ethernet IEEE 802.3 Local Area Networks (LANs). Through the ATX backplane, connectivity to other Fast Ethernet devices, as well as connectivity to FDDI, Token Ring, and Ethernet networks is supported. You can configure the module to support Transparent Spanning Tree, Source Routing, or Source Routing Transparent Bridging on each of the FDDI, Token Ring, or Ethernet ports of the ATX. The ATX is also able to translate higher level protocols to allow communications between end-nodes on Ethernet and end-nodes on FDDI or Token Ring; protocols translated include TCP/IP, Novel NetWare, and AppleTalk Phase II.

The switch modules include processing circuitry for receiving and forwarding data packets between the connected devices. Each module contains an offline button as well as several light emitting diodes (LEDs) that indicate the operational status of the module and the individual ports.

You can install the switch modules in any of the five interface slots of the ATX. Each switch module provides connectivity to four distinct 100 Mb LANs.

1.3   3H02-04 FE SWITCH MODULE

The 3H02-04 (Figure 1-2) provides connection for four independent 100BASE-TX LANs to the ATX backplane and packet processing engine (PPE). It includes processing circuitry for receiving and forwarding packets between the connected 100BASE-TX LANs within each module. The 3H02-04 contains several LEDs to indicate the module's operational status. Each segment has link test enabled and supports receive pair polarity reversal detection and automatic correction.

The 3H02-04 supports unshielded twisted pair (UTP) and IEEE 802.3 100BASE-TX specification.

1.3.1   **Connectors**

The 3H02-04 includes four 8-pin RJ45 receptacle connectors that you can attach directly to the network by using unshielded twisted-pair (UTP) cabling. The ATX power supply provides the power for the module.

NOTE	An internal receive/transmit pair crossover is provided in the second connector on each port. This means that when either a station or server is directly attached to a 3H02-04 port, you can choose to use either straight-through or crossover cabling. For more cabling and crossover information, see Appendix B.

1.3.2   **LEDs**

The 3H02-04 contains a total of 14 green LEDs labeled LINK, RX, and TX for each segment, plus PROC and PWR for the module. The LEDs are described in Chapter 5 of this manual.

1.3.3   **Offline Button**

Use the offline button before swapping the module, to take it offline until the replacement is installed.
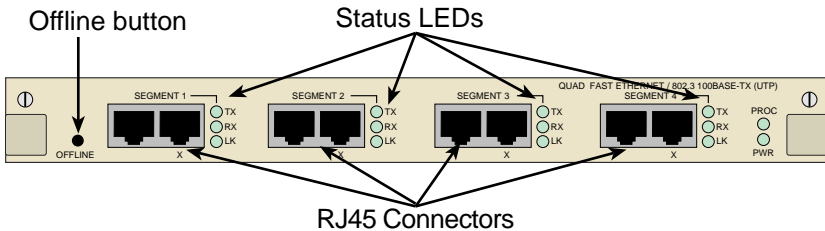
Figure 1-2   3H02-04 Front Panel

1.4   3H08-04 FE SWITCH MODULE

The 3H08-04 (Figure 1-3) provides connection for four independent 100BASE-FX LANs to the ATX backplane and packet processing engine (PPE). It includes processing circuitry for receiving and forwarding packets between the connected 100BASE-FX LANs within each module. The 3H08-04 contains several LEDs to indicate the module's operational status.

The 3H08-04 supports fiber optic and the IEEE 802.3 100BASE-FX specification.

1.4.1   Connectors

The 3H08-04 includes four pairs of fiber optic socket connectors for fiber optic cabling. Receive (RX) and transmit (TX) connectors are clearly marked on the front panel of the module. The ATX power supply provides the power for the module.

1.4.2   LEDs

The 3H08-04 contains a total of 14 green LEDs labeled LINK, RX, and TX for each segment, plus PROC and PWR for the module. The LEDs are described in Chapter 5 of this manual.

1.4.3   Offline Button

Use the offline button before swapping the module, to take it offline until the replacement is installed.
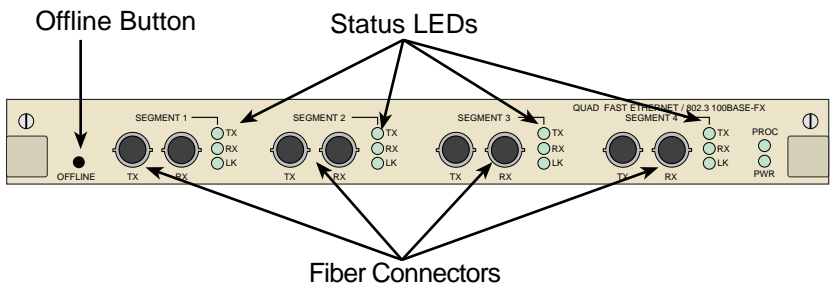
Figure 1-3   3H08-04 Front Panel

1.5   DOCUMENT CONVENTIONS

The following conventions are used throughout this document:
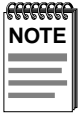
Note symbol. Calls the reader's attention to any item of information that may be of special importance.

Tip symbol. Conveys helpful hints concerning procedures or actions.

Caution symbol. Contains information essential to avoid damage to the equipment.

Warning symbol. Warns against an action that could result in equipment damage, personal injury or death.

Commands, prompts, and information displayed by the computer appear in Courier typeface.

```
Current Number of Station Addresses: 5
Current Number of Learned Addresses: 133
Number of Defined Filters: 4
```

1.6   RELATED MANUALS

Use the following manuals to supplement the procedures and other technical data provided in this manual. The procedures contained in the following manuals are referenced where appropriate, but not repeated in this manual.

•   *ATX User Guide*

•   *ATX MIB Reference Guide*

If you need internetworking reference material, you may find the following books helpful:

•   *Interconnections, Bridges and Routers*, Radia Perlman, Addison Wesley © 1992.

•   *Internetworking with TCP/IP: Principles, Protocols, and Architecture* (2nd edition), Volumes I and II, Douglas Comer, Prentice Hall © 1991.

•   *The Simple Book, An Introduction to Management of TCP/IP-based internets*, Marshall T. Rose, Prentice Hall © 1991.

1.7   GETTING HELP

If you need additional support related to this device, or if you have any questions, comments, or suggestions concerning this manual, contact Cabletron Systems Technical Support:

By phone	(603) 332-9400
	Monday – Friday; 8 A.M. – 8 P.M. Eastern Time
By CompuServe	GO CTRON from any ! prompt
By Internet mail	support@ctron.com
By FTP	ctron.com (134.141.197.25)
Login	*anonymous*
Password	*your email address*

Before calling Cabletron Systems Technical Support, have the following information ready:

- A description of the failure

- A description of any action(s) already taken to resolve the problem (e.g., changing mode switches, rebooting the unit, etc.)

- A description of your network environment (layout, cable type, etc.)

- Network load and frame size at the time of trouble (if known)

- The serial and revision numbers of all Cabletron Systems products in the network

- The device history (i.e., have you returned the device before, is this a recurring problem, etc.)

- Any previous Return Material Authorization (RMA) numbers

CHAPTER 2

CONNECTING TO THE NETWORK

This chapter provides reference material and instructions that network administrators can use to configure the Fast Ethernet Switch Modules.

For instructions on adding a switch module to the ATX, see Chapter 5, **Adding/Swapping Modules**.

2.1   POWER-UP LED SEQUENCE

Watch the LED sequence during power-up. It takes about 1 minute for the ATX to complete the power-up diagnostics. The ATX begins system diagnostics on the PPE (topmost module) and then individually on each installed module, starting at the top and working down to the bottom.

Using both processors, the specific power-up tests run on the switch module are:

• ROM checksum test

• Instruction memory test

• Memory map tests

• Interrupt tests

• Fast Ethernet data loopback tests

The power-up LED sequence for the Fast Ethernet module is as follows:

1. All LEDs flash.

2. The PWR LED remains on, and the TX LEDs flash.

3. On each switch module, the following occurs:

   a. The PROC LED comes on for 5 seconds, blinks, then remains lit.

   b. The RX and TX LEDs flash momentarily.

4. After a few seconds, the switch module reboots and the PROC LED comes on.

5. All other LED activity beyond this point is a function of the configuration and connection of the ATX.

2.2   CONNECTING TO A NETWORK

To connect the switch module to a Fast Ethernet network, use the following types of Ethernet cable:

• Unshielded Twisted Pair (UTP for 100BASE-TX)

• Fiber (100BASE -FX)

2.2.1   Connecting the 3H02-04 FE Switch Module

You can connect each of the four 100BASE-TX ports of the 3H02-04 to a 100BASE-TX port on a device such as a workstation, server, hub, etc., using unshielded twisted pair cable. Each segment on the 3H02-04 provides two connectors. Depending on whether crossover is provided on the device being connected to, use either crossover or straight-through UTP cable to connect to a port. Keep in mind, however, **to use only _one_ connector on each segment**. For more information on cable specifications, see Appendix B.

Connect one end of a UTP cable to an open port on the 3H02-04 and the other end to the RJ45 port on the device (see Figure 2-1).
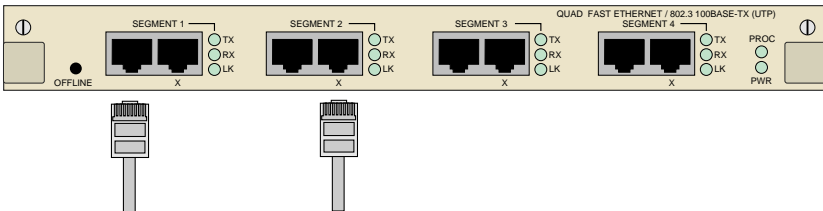
Figure 2-1   3H02-04 Front Panel Connectors

2.2.2 Connecting the 3H08-04 FE Switch Module

You can connect each of the four pairs of ST fiber ports on the 3H08-04 to a 100BASE-FX port on a device such as a hub, using fiber optic cable. Each fiber segment has a pair of female ST connectors clearly marked as "RX" and "TX."

Attach the transmit (TX) connector on the 3H08-04 to the receive (RX) connector on the attached device. Similarly, you must then connect the receive (RX) connector on the 3H08-04 to the transmit (TX) connector on the attached device (see Figure 2-2). For more information on cable specifications, see Appendix B.
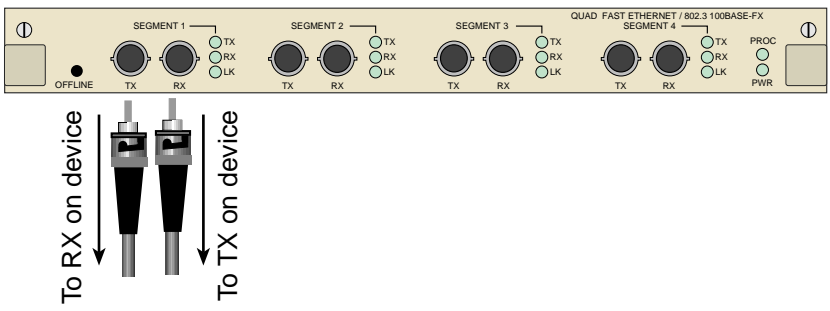
Figure 2-2   3H08-04 Front Panel Connections

CHAPTER 3
CONFIGURING

You can configure your FE Switch Modules using the following tools:

- Local Console Manager (LCM), which lets you monitor, manage, and configure your ATX through an out-of-band RS-232 connection

- Any SNMP-based network management system

For more details about Local Console Management, see your *ATX User Guide*. For details about the other network management software, see the product's documentation.

You can configure the following attributes using Local Console Manager:

- Port's IP address for originating and receiving IP packets

- Alarm thresholds for hardware errors

- Enabling/disabling a port's Transparent Spanning Tree, Source Routing, or Source Routing Transparent bridge mode

Also you can configure the following attributes using network management software, (see the NMS documentation for specific instructions):

- Parameters for diagnostic loopback testing of a port

- Protocol translations

Filtering normally occurs as part of the Transparent Spanning Tree and Source Routing algorithms. In addition, you can establish configurable criteria for filtering, to allow greater management control for security or network congestion reasons. All configured filtering criteria are maintained in non-volatile memory and are saved across power cycles. Filtering information is covered in the *ATX User Guide*.

3.1   CONNECTING THE LOCAL CONSOLE MANAGER

Connect the Local Console Manager to the ATX. For specific
instructions, see Chapter 2, **Connecting to the Network** of the *ATX User
Guide*.

Make sure the ATX is powered on and press <Return> a few times. When
the ATX> prompt is displayed, the Local Console Manager is ready to
use. The default password is <Return>.

3.2   LOCAL CONSOLE MANAGER COMMANDS

To configure the switch modules, refer to the *ATX User Guide* for Local
Console Manager commands generic to all modules, Make sure you're
familiar with Local Console Manager before configuring the module. For
specific instructions on displaying the port status, see Chapter 4.

CHAPTER 4
MONITORING

4.1   DISPLAYING SWITCH MODULE PORT STATUS

Using Local Console Manager, you can get the status of the switch
module ports by typing status for the appropriate switch module port. A
sample display is shown below.

```
ATX >status 3
Port 3 (1st port on module 3) status

Type: 100 Mbps Ethernet/802.3 CSMA/CD
Bridging: Transparent/Translating
Routing: IP Routing
Enabled/Disabled: Bridging/Routing functions enabled
Spanning Tree: Forwarding
Pkts Transmitted: 2021469
Pkts Received: 1078
Small Buffers: 36
Rx_Q Overflows: 0
Carrier Losses: 0
Total Collisions: 4
Excess Collisions: 0
Rx FCS/Align Errs: 0
Internal Rx Errs: 0
Internal Tx Errs: 0
```

The status of a switch module port includes the following information:

- Type - 100 Mbps Ethernet/802.3 CSMA/CD

- Bridging - which functions have been enabled for bridging (see the
  bridge command).

- Routing - which functions have been enabled for routing (see iproute
  and ipxroute commands).

- Enabled/Disabled - enabled if it is operational or, disabled if you used
  the disable command to disable it. If the port is enabled but not
  operational, its status will be broken. (A port could be broken if it is so
  badly misconfigured as to be unusable. You might see a status of
  broken if a FDDI or Token Ring port can't connect to a logical ring, or
  if an Ethernet or Fast Ethernet port continually fails as it tries to
  transmit.)

- Spanning Tree - the port's Spanning Tree state, which could be any one of the following states:

    - Blocking - The port isn't currently the designated port to a LAN and is not forwarding any packets. (This means another port is providing the route to that LAN and since the Spanning Tree protocol doesn't allow simultaneous redundant paths, the port is blocked. If the other port's route to that LAN goes down, this port would then start forwarding packets.)

    - Listening - The port is listening for other bridges on the network to determine if it should go to the forwarding or blocking state.

    - Learning - The port is listening for other bridges on the network and making a table of addresses from packets that it has received. Once the port goes to the forwarding state, it can then use the address information it has learned.

    - Forwarding - The port is the designated port for the LAN and is forwarding packets and sending out bridge protocol packets.

    - Broken - The port is not forwarding packets. Reasons for a broken status might include no cable connected, no link status, the ring is not operational, or an NMS has disabled the port.

    - Disabled - The port isn't configured for Spanning Tree.

- Pkts Transmitted - number of packets transmitted from the port. This includes any packets that might have experienced transmission errors. (The port's statistics are reset whenever the port is started.)

- Pkts Received - number of good packets received through the port. Packets with reception errors are not included, nor are packets local to that segment that are hardware filtered.

- Small Buffers - number of buffers currently assigned to the port (see RX_Q Overflows below).

- RX_Q Overflows - number of incoming packets the port had to drop because of a lack of buffers. After a reboot, the ATX tries to automatically re-allocate the Small Buffers among the ports so that the total number of RX_Q Overflows is minimized.

- Carrier Losses - the number of packet transmissions that detected a loss of carrier (usually a transceiver problem).

- Total Collisions - number of collision during packet transmissions.

- Excess Collisions - number of packet transmissions that were aborted due to 16 collisions (usually a transceiver problem).

- RX FCS/Align Errs - number of times a received packet was discarded due to a bad checksum or Frame Alignment error.

- Internal RX Errs - number of times an inbound packet was dropped due to an internal error. (Whenever a packet is dropped due to TX_Q Overflows, Internal RX Errs may also be incremented.)

- Internal TX Errs - number of times a packet transmission was aborted due to an internal error.

| NOTE | All of the counter values are reset to zeros if the ATX is rebooted or if the module housing that port is stopped and restarted. |

CHAPTER 5

DIAGNOSTICS AND TROUBLESHOOTING

Built-in diagnostic capabilities for the FE Switch Modules include:

- Power-up diagnostics, which are run every time the switch module is brought on line

- Front panel status LEDs

- Local and remote loopback tests

- Temperature sensors

5.1   POWER-UP TESTS

The power-up diagnostics assure that the ATX and all the installed modules are operating. During diagnostic mode, the status LEDs are used differently than during normal operation.

When you power up the ATX, it automatically senses the installed boards and reassigns port numbers, starting with the PPE as port 1. During a normal power-up test, the diagnostics test the entire ATX, starting with the PPE, and going from slot to slot, from the top down. The normal power-up sequence is described in Chapter 2, **Connecting to the Network**.

5.2   POWER-UP RESULTS

After the power-up diagnostic sequence is complete, all status LEDs on the ATX front panel should be on (lit), indicating that the modules have passed the power-up tests (see Table 5-1 and Table 5-2). If a switch module fails a critical test, it is automatically disabled.

Table 5-1   Meaning of 3H02-04 LED Indicators

LED	Meaning
LK	100BASE-TX port is connected to another device by a cable; both the cable and port are working correctly
RX	100BASE-TX port is receiving data (LED flashes)
TX	100BASE-TX port is transmitting data (LED flashes)
PROC	Switch module processor is ready for operation
PWR	Switch module hardware is receiving power

Table 5-2   Meaning of 3H08-04 LED Indicators

LED	Meaning
LK	100BASE-FX port is connected to another device by a cable; both the cable and port are working correctly
RX	100BASE-FX port is receiving data (LED flashes)
TX	100BASE-FX port is transmitting data (LED flashes)
PROC	Switch module is ready for operation
PWR	Switch module hardware is receiving power

5.3   OPERATIONAL DIAGNOSTICS

You can use local and remote loopback tests to test individual ports while the ATX is operational. When in local loopback, a port is disconnected from its network. The ATX generates loopback packets for the port, and the port loops the packets back without sending them onto its network.

During a remote loopback test, the port is in normal operation, sending and receiving packets to its network. The ATX generates loopback packets which are sent out of the port to a particular destination device on the ports network. The destination device echoes the packet back onto the network, and the originating port receives the packet.

For both types of tests, normal operation is indicated when generated packets are received back (after looping) without errors. For remote loopback tests, the ATX creates LLC Type 1 test packets for LANs and PPP echo-request packets for WANs and UARTs.

To start both types of loopback tests, use the NMS. When you use the NMS for these tests, the results are reported back to the NMS.

5.4 DIAGNOSTIC RESULTS

ATX diagnostic results are indicated in two ways: by looking at the front panel LEDs (which are explained later in this chapter) or by reading NMS trap messages. Both power-up and loopback diagnostics produce traps, which are sent to the NMS and may be logged for future reference. Although you might find it more convenient to just watch the LEDs, in most cases traps provide more information. There are no LEDs for the loopback tests–the results of these tests must be observed (i.e., accurate packet transmission) or read using an NMS (i.e., examine traps).

5.5 TROUBLESHOOTING

5.5.1 If the Module Fails to Power Up

If the FE Switch Modules fail to power up when the ATX is on and functioning properly:

1. Check the status of ports using Local Console Manager.

2. Reset the switch module and watch the power-up sequence again.

3. If the sequence is still abnormal:

    a. Remove the interface module by unscrewing the two retaining screws on the module front panel.

    b. Carefully, but firmly, press down on all socketed components.

    c. Re-install the module. Make sure the module is properly seated and tighten the retaining screws.

    d. Reset the ATX and observe the power-up sequence.

4. If it is still abnormal, contact Cabletron Systems Technical Support.

5.5.2   Connectivity Problems

If the FE Switch Modules power up normally, but the workstations are unable to communicate:

1. Check the LED for abnormalities which may help indicate the source of the problem. (LED behavior during normal operation is explained earlier in this chapter.)

2. Check the status of the ports using Local Console Manager

3. Check for loose connections between the switch module and devices.

4. Check that the proper type of cable is used: crossover or straight-through, depending on the configuration; distance limitations are adhered to, etc. (For more information on other limitations or restrictions that may apply, see the IEEE 802.3 standards specification.)

CHAPTER 6

ADDING/SWAPPING MODULES

Once you have received your ATX, you may want to add a new module to expand your network bandwidth, replace a module with a module of a different type, or swap a module with another module of the same type. If you are:

- Adding a switch module to a previously vacant slot or to a slot that had a different type of module, see **Adding a Switch Module**, below, for instructions.

- Replacing a switch module with another switch module of the same type, see **Swapping a Switch Module**, below.

Before adding or swapping modules, see the latest version of the ATX Release Notes (provided with your ATX software) for information about software and hardware version numbers and compatibility.

6.1   UNPACKING THE SWITCH MODULE

Unpack the switch module carefully, handling it by the edges only, and inspect it for damage. If any damage is evident, contact Cabletron Systems Technical Support immediately. Save the original container and antistatic wrap in case the module needs to be repaired.

6.2   ADDING A SWITCH MODULE

If the switch module you are adding is different from the type of module that was in the slot earlier, or if the slot was vacant, you have to reboot the ATX so it will recognize the new module.

If the module you are adding has a different number of ports than the module you are removing, before you can power cycle the ATX you must:

- Delete all static addresses

- Delete all ARP addresses and IP routing table entries

- Delete all filters

1. Make sure the ATX is powered off.

2. Remove the network connections from the module you are going to replace.

3. Loosen the screws at each end of the front panel of the interface module you are going to replace.

4. Remove the installed interface module by pulling gently, but firmly, on the ears at the ends of the module's front panel.

5. Gently slide the switch module into the plastic guides in the module slot until it is completely inserted. Push the module firmly into place, as far as it will go, to fully engage the connectors at the back of the module with the backplane at the rear of the ATX chassis.

6. Tighten the screws on each side of the switch module's front panel.

7. Power on the ATX, and check the switch module LED power on sequence as described in Chapter 2, **Connecting to the Network**.

8. Make the connections to the network as described in Chapter 2.

6.3 SWAPPING A SWITCH MODULE

When swapping identical modules, it is recommended that you remove power to the ATX. However, the switch module you are replacing must be taken offlline first, as described below:

1. Take the switch module to be replaced offline, either by pressing the OFFLINE button on the switch module front panel, or by using the Local Console Manager `offline` command.

2. Remove power from the ATX.

3. Remove the network connections from the switch module. Note the ports to which the network connections attach.

4. Loosen the screws at each end of the front panel of the switch module to be replaced.

5. Remove the installed switch module by pulling gently, but firmly, on the ears at the ends of the module's front panel.

6. Gently slide the new switch module into the plastic guides in the module slot until it is completely inserted. Push the module firmly into place, as far as it will go, to fully engage the connectors at the back of the module with the backplane at the rear of the ATX chassis.

7. Tighten the screws on each side of the switch module's front panel.

8. If you took the original module offlline by pressing the OFFLINE button, the new switch module will automatically come back online when it is inserted in the slot.

   If you used the Local Console Manager `offline` command to take the original module offline, you must use the `online` command to bring the new module online.

9. Check the switch module LED power-on sequence as described in Chapter 2, **Connecting to the Network**.

10. Make the connections to the network as described in Chapter 2.

APPENDIX A
TECHNICAL SPECIFICATIONS

Standards Compliance

- Ethernet Version 2

- IEEE 802.3, 802.3u, 802.2, 802.1(d), 100BASE-TX, 100BASE-FX

Protocol Translations

- TCP/IP

- IPX

- AppleTalk Phase II

Dimensions

Length	12.2 in. (30.99 cm)
Width	9.5 in. (24.13 cm)
Weight	approximately 1.375 lb. (.62 kg)

Environmental Requirements

Operating temperature	5˚ C to 40˚ C (41˚ F to 104˚ F)
Storage temperature	-30˚ C to 90˚ C (-22˚ F to 194˚ F)
Relative humidity	0% to 95% non-condensing

Connectors

3H02-04	RJ45 for UTP
3H08-04	ST for Fiber Optics

LEDs

- Power
- Processor (Processor status/ready)
- Link
- Collision
- Receive
- Transmit

Bridging Domain

- Transparent
- Source Routing
- Source Routing Transparent

Certifications

Safety	UL 1950, CSA C22.2 No. 950, EN 60950, and IEC 950
Emission	FCC Part 15 Class A, EN 55022 Class A, and VCCI Class I
Immunity	EN 50082-1

APPENDIX B

CABLES

B.1 TYPES/CONNECTORS

Depending on the type of switch module you are using, you'll need to use specific cables, as described in the IEEE 802.3u specification, shown in the table below.

Table B-1   Cable Types and Connectors

Cable	Type	Male Connector
Twisted-Pair (UTP)	100 Ohm UTP, 22 - 26 AWG 0.4 - 0.6 mm, 2 pairs	8-pin RJ45
Duplex Fiber	62.5/125 Micron Core	ST

B.2 CABLE SPECIFICATIONS

Table B-2   Twisted-Pair Cable Specifications

Type	Type 5 balanced UTP
Number of Pairs	2
Max. Link Segment Length	328 ft (100 m)
Min. Link Segment Length	2.0 ft (0.6 m)
Max. Number of Attachments	2

Table B-3   Duplex Fiber Cable Specifications

| Type	62.5/125 micron core multimedia fiber
Max. Link Segment Length	1.24 mi (2.0 Km)
Min. Link Segment Length	No minimum size
Max. Number of Attachments	2
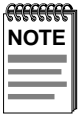
NOTE	You can also choose to use 50/125, 80/125, or 100/140 micron core multimedia fiber; however, data in the table above applies only to the 62.5/125 type.

B.3 FAST ETHERNET PIN ASSIGNMENTS

B.3.1   About RJ45 Connectors

If you're connecting a 3H02-04 to another device, it's required that you use only RJ45 connectors on the cabling. An Ethernet twisted-pair link segment requires two pairs of wires. Each wire pair is identified by solid and striped colored wires. For example, one wire in the pair might be red and the other wire, red with white stripes.
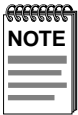
NOTE	You must connect each wire pair to the RJ45 connectors in a certain orientation (See "Crossover Wiring for the 3H02-04" on page B-3 for an explanation).

Refer to the diagram below and note how the pins are numbered. Be sure to hold the connectors in the same orientation when connecting the wires to the pins.
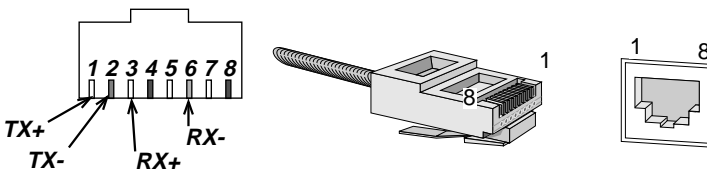

Figure B-1   RJ45 Connector Pin Numbers

Each twisted-pair link segment must have an RJ45 male connector attached to both ends. According to the 100BASE-T specification, pins 1 and 2 on the RJ45 connector are used for transmitting data; pins 3 and 6 are used for receiving data, as shown below.

Table B-4   RJ45 Crossover Pin Assignments

RJ45 Pin	Assignment[*]
1	Tx+
2	Tx–
3	Rx+
6	Rx–

*The "+" and "–" signs are used to represent the polarity
of the two wires that make up each wire pair.

B.3.2   Crossover Wiring for the 3H02-04

Two Ethernet 100BASE-TX devices can communicate only if the
transmitter on one device is connected to the receiver on the other device.
This reversal, or crossover function, can be implemented either in the
wiring or in the device itself. The 3H02-04 contains an internal port
crossover on the second connection of each port. This means that you can
choose to use either crossover or straight-through cabling.

When connecting two identical twisted-pair ports (i.e., both crossover
ports or both straight-through ports), you must implement a crossover in
the wiring. Refer to the following table for crossover wiring configuration
for the 3H02-04.

Table B-5   Crossover RJ45 Wiring Configuration

Hub (pin number)	Device (pin number)
1	3
2	6
3	1
6	2

B.3.3   Straight-Through Wiring for the 3H02-04

If the twisted-pair link segment is to join two ports and only one of the ports has an internal crossover, the two pairs of wires must be straight-through, as shown below.

Table B-6   Straight-Through RJ45 Wiring Configuration

Hub (pin number)	Device (pin number)
1	1
2	2
3	3
6	6

B.3.4   Limitations & Restrictions

Between any two nodes (such as PCs or other stations) on the network, there may be limitations or restrictions that you should be aware of. For more information on any limitations or restrictions, see the IEEE 802.3 specification.

B.3.5   Definitions

Backbone
A coax segment with hubs, possibly file servers.

Cascade
A method of interconnecting hubs using their ports rather than their stacking connectors.

Link Segment
A length of twisted-pair or fiber cable joining a pair of devices in a star topology (e.g., two hubs or a hub and a station).

Stack
A method of interconnecting multiple hubs so that multiple hubs appear as one large hub or repeater to the network.

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